

tion, the less room there is for differences of opinion on what is wanted in the answer. Finally, I must stress that, although in OT ranking order is exact, there is still the question of where to put both the pass-fail and any inter-class barriers.

Certain disadvantages of OT should be mentioned.

(1) Setting can be as time-consuming as machine-marking is simple. Spread must continuously be checked; the position of the right answer must be varied; distractors must be both plausible and of similar plausibility. Finally, in the marking, there must be a penalty for guessing.

(2) Especially in SOT, there is only one right answer. Especially in science, a particular point may be very debatable and anything but simple. Like programmed learning (get the sole accepted answer before going on to the next step), OT can inject an unhealthy authoritarianism and superficiality.

(3) In general, both knowledge of facts and ability to apply them should be tested. Ability to choose relevant facts and marshal them in logical order can be tested only by the essay (or orally). Even if there is a problem in an OT paper, one can know only what answer has been derived (or, in SOT, selected). What is much more important, how this was deduced can never be known.

(4) At times OT can test even factual knowledge only in a very cumbersome manner if at all. The sensible test of a definition is to ask for it—which may be beyond the scope of an ROT question; ability to translate (knowledge of vocabulary and grammar) can be tested only by translation; knowledge of phonetics is best tested by writing a passage in phonetics; one of the best tests of familiarity with literature is the question "Assign to context: . . .".

(5) Such a question as "With an example for each consonant mentioned, give an account of Grimm's Law", although an essay question is not only about the only one that could be asked on the Law, but is also quite objective. All these examples are of areas in which the "essay" question is superior to the OT question in testing factual knowledge and can be marked as accurately as the latter.

OT is not to be condemned bell, book and candle. All methods of examining have their merits and demerits. Since Dr Cox's paper leaned heavily towards OT, it is only right that my reply should emphasize the opposite case.

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## Cancer Research

SIR,—Dr John Paul comments (*Nature*, 240, 492; 1972) on your correspondent's report entitled "Lord Zuckerman Defends his Position" (*Nature*, 240, 247; 1972) and refers to what I said at the meeting of the British Association for Cancer Research.

I spoke about the development of the four new oncological centres, made a plea for closer integration of work being done in laboratories, in clinics and in the field and asked for greater emphasis on the flow of ideas from clinic to laboratory. I also asked some questions about accountability, effectiveness and efficiency, suggesting that in the context of the human cancer problem it was no less necessary and no more invidious to ask for assessment of the relevance and value of work done at subcellular level than it was at patient or community levels.

Dr Paul complains that in advocating greater emphasis on clinically oriented research, I was wrong in claiming that supracellular biologists had made a greater contribution to the welfare of the cancer patient than molecular biologists. The passage from my talk referred to was as follows:

"The mere asking of such controversial questions has been taken by some subcellular biologists to be a denial of the importance of their work, rather than an encouragement of the work of the supracellular biologists who have to date made a far greater contribution to the welfare of the cancer patient. 'Fundamental cancer research' has yet to match the long record of success of clinical and epidemiological investigations to which we owe so much in cancer prevention, detection and treatment. Hormone control of cancer arose from the observations of a surgeon, and both radiotherapy and chemotherapy had their origins in observations of their effects on man. Each clinical discovery has led to the creation of new research departments to fill important feedback functions. Successful preventive measures have stemmed in the case of mouth cancer from the work of the dental profession, and in lung cancer from that of the epidemiologists and statisticians. If cancer research is to advance more quickly toward practical control of the human disease processes involved, rather than make progress in some other if perhaps equally important function, then those engaged must have a close contact with the clinical scene and derive inspiration from it."

Of course it is Dr Paul who is wrong. His suggestion that cancer chemotherapy stemmed from molecular biology is quite untenable; it stemmed from clinical observation, its increasingly effective combinations developed

from clinical practice and biochemistry was brought in later and most helpfully to support, to develop and to attempt to account for the success achieved.

Arguments about the merits of research at different biological levels are unprofitable since we need to understand the mechanisms of disordered growth at all levels of organization. I was discussing emphasis and relative effort. I am glad to see that Dr Paul, though regarding me as "puckish" when I am serious, also regards me as "reasonable" in holding the view that distinctions based on the value of work at different biological levels are pointless and that coordination of work at all levels is essential.

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## Acupuncture

SIR,—There has been much recent interest in acupuncture, but as early as 1823 a treatise on the subject was published in England. In the December issue of *The British Critic*, 668 (1823), an unnamed reviewer discusses three new books. Each seeks to introduce a foreign method of medical treatment, and the only one which the reviewer feels is "deserving of serious consideration" is:

"Art XII. A Treatise on Acupuncture; being a Description of a Surgical Operation originally peculiar to the Japanese and Chinese and by them denominated Zin-King, now introduced into European Practice, with Directions for its Performance, and Cases illustrating its Success. By James Morss Churchill, Member of the Royal College of Surgeons in London. 8vo. 86 pp. 4s. Simpkin and Marshall. 1823."

Churchill's book receives the bulk of critical attention, while the other two, a treatise on Fumigating Baths (from France) and a treatise on Shampooing (from India), receive minimal attention as they are thought to be "of little worth".

In several long passages quoted from Churchill's book, the technique of acupuncture is described, and a whole range of maladies for which it had proved useful are mentioned. Churchill cites in particular two cases in which he himself had successfully performed acupuncture. The first was a woman suffering from rheumatic pain, the other was "William Morgan, a young man in the employment of a timber merchant". The latter had strained